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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of

KADNER et al.

Appln. No.: 08/039,498 Group Art Unit: 1103

Filed: April 28, 1993 Examiner: G. Straub

Title: THE PROCESS FOR PRODUCING ALUMINUM OXIDE

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March 20, 1995

BRIEF ON APPEAL

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

This is an Appeal of the rejections of the Final Office Action dated July 22, 1994 of claims 12 and 15-18, the only claims still pending in this case. No claims stand allowed.

STATUS OF CLAIMS

Pursuant to the Advisory Action of November 10, 1994, the rejection of claims 12 and 15-18 under 35 U.S.C. § 103 as being unpatentable over Bezzi et al. has been withdrawn, as has the rejection of claims 12 and 15-18 under 35 U.S.C. § 103 as being unpatentable over Bezzi in view of Takumi et al. and Sanchez et al.

The only remaining rejection is of claims 12 and 15-18 under 35 U.S.C. § 103 as being unpatentable over Bezzi et al. in

view of Takumi et al. or Sanchez et al., and further in view of Landis or DeHaven et al.

Claims 1-8 have been cancelled without prejudice in the Amendment filed April 4, 1994. Claims 9, 10, 11, 13 and 14 have been cancelled without prejudice in the Amendment filed pursuant to 37 C.F.R. § 1.116 on October 14, 1994. Consequently, the only claims on appeal are claims 12 and 15-18. The rejection of these claims as appealed. Please see the Appendix for a copy of claims 12 and 15-18.

STATUS OF AMENDMENTS

Pursuant to the Advisory Action of November 10, 1994, the Amendment filed October 14, 1994 under 37 C.F.R. § 1.116, filed subsequent to Final rejection, is entered.

In the Advisory Action dated January 3, 1995, the Examiner has indicated that the Amendment Under 37 C.F.R. § 1.116 dated December 22, 1994 has been considered. It is presumed that this amendment is also entered into the record.

CONCISE EXPLANATION OF THE INVENTION

The presently claimed invention relates to an improved process for producing aluminum oxide beads. As recited in independent claim 16, the process comprises converting a member of the group consisting of an acid aluminum oxide sol and an acid

aluminum oxide suspension with a viscosity of 10 - 500 mP's into hydrosol droplets. The droplets are then coagulated in an aqueous ammonia solution to form gel beads. The gel beads are then washed, dried and calcined.

The improvement of the invention comprises forming the hydrosol droplets by passing the above-referenced acid aluminum oxide sol for acid aluminum oxide suspension through a vibrating nozzle plate, which is vibrated at a frequency of 10 Hz to 20 Hz. The vibrating plate has several nozzles. The droplets are pre-solidified by blowing ammonia gas against them. The pre-solidified droplets are then collected in the aqueous ammonia solution, wherein nozzles are disposed on a ring, and the droplets passing the nozzles are pre-solidified with ammonia gas blown from the ring interior and ring exterior against the droplets.

As recited in dependent claim 17, the improvement may further comprise the presence of a surface active agent in the aqueous ammonia solution for foam generation. As recited in dependent claim 18, the improvement may further comprise the presence of a foam of 5 to 20 mm depth on the aqueous ammonia solution to improve the bead shape.

As recited in dependent claim 12, the aluminum oxide beads can be dried at a temperature of 20 - 300°C for 1 to 24 hours. As recited in dependent claim 15, the beads may be calcined for 2 - 12 hours at 500 to 700°C.

The above constitutes a concise explanation of the invention defined in the claims involved in this appeal.

CONCISE STATEMENT OF THE ISSUE PRESENTED FOR REVIEW

In the Advisory Action dated November 10, 1994, the following rejections were withdrawn:

(1) The rejection of claims 12 and 15-18 under 35 U.S.C. § 103 as obvious over Bezzi et al.; and

(2) The rejection of claims 12 and 15-18 under 35 U.S.C. § 103 as obvious over Bezzi et al. in view of Takumi et al. and Sanchez et al.

The only remaining issue for review is whether claims 12 and 15-18 are obvious under 35 U.S.C. § 103 over Bezzi et al. in view of Takumi et al. or Sanchez et al., and further in view of Landis or DeHaven et al.

GROUPING OF CLAIMS

Appellants submit that, for the reasons set forth below, the rejected claims are separately patentable and thus do not stand or fall together.

APPELLANTS' ARGUMENTS

Claims 12 and 15-18 are not rendered obvious by Bezzi et al. taken with Takumi et al. or Sanchez et al., in view of Landis or DeHaven et al.

This last remaining § 103 rejection in the Final Office Action holds the present invention obvious by a combination of primary, secondary and tertiary references. As shown below, the maintenance of this rejection does not meet the legal tests for finding an invention obvious under § 103.

Appellants' process produces aluminum oxide beads with optimum spherical shape and narrow grain spectrum, in conjunction with suitable porosity and high breaking strength plus low abrasion loss. These beads are economically produced using the claimed process which employs high throughput rates and optimal reaction conditions for producing the desired spherical aluminum oxide beads. Numerous prior art failures to solve the particular problem solved by the inventors are reported in the background section of the specification.

At the heart of the rejection is the Bezzi et al. reference. However, as apparently acknowledged by the Examiner, the primary reference Bezzi does not teach or suggest a process of producing aluminum oxide beads in contrast to the claimed invention, Bezzi discloses a method for producing microspheres of **uranium** oxide using a reacting gas.

Bezzi relates to a method of producing microspheres by vibrations using a string of droplets of a solution to be

solidified by vibration. The droplets building a string pass a stream of reacting gelling gas. Contact occurs only on one side of the droplets. As someone skilled in this art would be aware, this one-sided contact **must** lead to an insufficient pre-solidification, such that deformation of the droplets results when they fall into liquid. To avoid such deformation, Bezzi teaches to overlay the solution of a gelling agent with a cushioning foam.

Due to the fact that the droplets are falling down along a string, the droplets are partly pre-gelled when blown from only one side by the reacting gas. If the droplets would pass nozzles disposed on a ring, it is obvious that only those droplets would be pre-gelled which face the reacting gas. However, all other droplets which are shadowed by the droplets in front of the gas distributor would not be pre-gelled. All of these non-pre-gelled droplets are therefore flattened when contacting the foam layer and especially by contacting the solution of the gelling agent. As a result, beads of a uniform size are not produced.

Thus, even if it were obvious to employ aluminum oxide in the Bezzi process, the resulting aluminum oxide element would not have an optimum spherical bead shape and narrow grain spectrum, in conjunction with suitable porosity and high breaking strength plus low abrasion loss.

The secondary and tertiary references do not make up for the deficiencies of Bezzi. As is apparently acknowledged by the Examiner, Takumi does not teach pre-solidification by a reactive gas. Takumi relates to the manufacture of a spherical aluminum from Gibbsite by using the classical internal gelation oil-drop method. A solution containing hexamethylenetetramine is used, which is decomposed by temperatures in the range of 90°C. In Takumi's process, hydro-gel particles are formed. To achieve the necessary temperature, the droplets containing hexamethylenetetramine must be passed through a hot oil bath. The droplets do not pass any gas flow, but are produced within the oil bath.

As with Bezzi, Takumi provides nothing persons of ordinary skill would reasonably use to be lead to the claimed invention. As specifically recited by independent claim 16, the invention **requires** "pre-solidifying said droplets in said aqueous ammonia solution, wherein the nozzles are disposed on a ring and said droplets passing said nozzles are pre-solidified with ammonia glass blown from ring interior and ring exterior against said droplets." In direct contrast with Takumi, **the invention requires pre-solidification by a reactive gas**, and <u>not</u> an oil bath. In the invention, the beads themselves are produced at room temperature.

Whereas Takumi teaches the production of droplets using an internal gelation oil drop method, Sanchez relates to an

external gelation oil drop method. In column 18, Sanchez teaches the production of spheroidal aluminum particles using an external gelation oil drop process where droplets falling from nozzles are surrounded by an airflow to keep ammonia vapor from prematurely gelling the droplets. The droplets then fall into a water-immiscible liquid an ammonia for pre-solidification. The volume of droplets falling into the water-immiscible liquid depends upon the concentration of ammonia. Therefore, as persons skilled in this art would be aware, it would be necessary to upgrade the water-immiscible liquid often with ammonia.

In Sanchez, aqueous ammonia is beneath the water-immiscible liquid for forming the particles. Between the water-immiscible liquid and the aqueous ammonia is an interphase. This interphase has the effect of a resistance against an immediate falling of the droplets into the aqueous ammonia solution. As a result, an agglomeration of droplets occurs on the interphase which leads to droplets having an irregular shape. Like the other references cited by the Examiner, the resulting particle would not have an optimum spherical bead shape and narrow grain spectrum, in conjunction with suitable porosity and high breaking strength plus low abrasion loss.

Both of the tertiary references, Landis and DeHaven, relate to a prilling method which, as persons skilled in this art would be aware, is not comparable with the invention which utilizes a sol-gel method. Landis describes a process for

prilling urea by contacting molten urea droplets with a co-current gas stream in a prill tower. Landis neither teaches nor suggests a controlled pre-solidification of droplets using a reactive gas blown against the droplets from all sides. To derive such a teaching from Landis requires an unduly retrospective view of this reference. Appellants believe that it is clear from the face of this reference that Landis does not make up for the deficiencies of the primary or secondary references.

DeHaven teaches a method for producing droplets from a melt. DeHaven can easily be distinguished from the claimed invention in that this reference requires a physical pre-solidification, whereas the claimed invention utilizes a chemical pre-solidification. While physical pre-solidification and drop formation both involve the formation of droplets from a melt using a vibrating plate, the other features which characterize the claimed invention are not mentioned at all, such as for example, the blowing with an ammonia gas. Appellants respectfully but earnestly submit that persons skilled in this art would not have been motivated to confine DeHaven with either the primary secondary references with any reasonable prediction of achieving the claimed invention.

In view of the clear deficiencies of the cited art, it is respectfully submitted that the Examiner has not proffered sufficient grounds upon which to base a case of prima facie

obviousness. The Federal Circuit's decisions on the requisites for a proper rejection under § 103 makes it clear that the citation of this combination of art cannot support such a rejection here. In re O'Farrell, 853 F.2d 894 (Fed. Cir. 1988); In re Ely Lilly & Co., 902 F.2d 943 (Fed. Cir. 1990). As the cases in this area make clear, this is, at best, an obvious to try situation.

Appellants respectfully submit that only in combination with the disclosure of the subject application would these references conceivably have rendered the claimed invention obvious. It is respectfully submitted that the Examiner is applying hindsight in maintaining this rejection, which is an impermissible basis for unobvious rejection. These references are simply not combinable to achieve the specifically claimed improvement process for producing aluminum oxide beads. Indeed, the cited art does not even recognize the problem solved by the inventors or the benefits achieved by the claimed process. Appellants believe that the Examiner has failed to point where in each of the references, persons skilled in the art would have found any motivation to combine these particular references to achieve the specifically recited process claimed. It is submitted that this rejection cannot be maintained, absent and express or implied suggestion of the specifically claimed invention in at least one of the references. In re Levitt, 11 USPQ2d 1315 (Fed. Cir. 1989); Interconnect Planning Corp. v.

Feil, 774 F.2d 1132 (Fed. Cir. 1985); In re Laskowski, 871 F.2d 115 (Fed. Cir. 1989).

Persons of ordinary skill in this art could not have known or reasonably speculated that the presently claimed process for producing aluminum oxide could be achieved by routine experimentation from anything disclosed or suggested by the cited art. It is therefore submitted that these rejections do not pass muster under a true § 103 analysis, since there is no suggestion in any of the references that they can be combined to produce the result obtained by the claimed invention. In re Shaffer, 229 F.2d 476 (C.C.P.A. 1956).

A § 103 inquiry must involve consideration of at least two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed invention, and (2) whether the prior art would have also reveal that in so doing, those of ordinary skill would have a reasonable expectation of success. **Both the suggestion and the reasonable expectation of success must be founded in the prior art, not the applicants' disclosure.** In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991). Appellants point out again that none of the cited art suggests or convey a reasonable expectation of success for obtaining the claimed process. It is believed that only in the applicants' own disclosure is the suggestion of the invention first articulated with any reasonable expectation of success.

Thus, Appellants earnestly submits that claims 12 and 15-18 are clearly distinguishable over any combination of the cited art. For all of the above reasons, Appellants respectfully submit that the rejection of the present invention under § 103 is not sustainable as a matter of law.

CONCLUSION

To summarize, it is believed that the presently claimed invention of claims 12 and 15-18 are fully patentable under 35 U.S.C. § 103 over Bezzi et al. in view of Takumi et al. or Sanchez et al., and further in view of Landis or DeHaven et al.

Accordingly, the reversal of this rejection is respectfully submitted.

Respectfully submitted,

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APPENDIX

12. A process as set forth in claim 16 in which the aluminum oxide beads are dried at a temperature of 20 - 300°C for 1 to 24 hours.

15. A process as set forth in claim 16 which said beads are calcined for 2-12 hours at 500 to 700°C.

16. In a process for producing aluminum oxide beads, said process comprising converting a member of the group consisting of an acid aluminum oxide sol and an acid aluminum oxide suspension having a viscosity of 10 to 500 mP's into hydrasol droplets, coagulating said droplets in an aqueous ammonia solution to form gel beads, and again, washing, drying and calcining the gel beads;

the improvement comprising forming said hydrosol droplets by passing said member of the group consisting of an acid aluminum oxide sol or an acid aluminum oxide suspension through a vibrating nozzle plate, which is vibrated at a frequency of 10 Hz to 20,000 Hz, said vibrating plate having several nozzles, pre-solidifying said droplets by blowing ammonia gas against them, and collecting the pre-solidified droplets in said aqueous ammonia solution, wherein the nozzles are disposed on a ring and said droplets passing said nozzles are

pre-solidified with ammonia gas blown from ring interior and ring exterior against said droplets.

17. A process as set forth in claim 16 wherein the improvement further comprises the presence of a surface active agent in said aqueous ammonia solution for foam generation.

18. A process as set forth in claim 16 wherein the improvement further comprises the presence of a foam of 5 to 20 mm depth on said aqueous ammonia solution to improve bead shape.